

Technology Innovation Project



Project Brief

TIP 315: Develop Self-Monitoring Substation Protection and Control System using the IEC 61850 Standard and PMU Data from Protective Relays

Context

Modern Micro-processor relays support Phasor Measurement Units (PMUs) and Generic Object Orientated System-wide Events (GOOSE) messaging of the IEC 61850 standard. If PMUs are enabled, AC measurements can be continuously verified by comparison. Using GOOSE messaging for input and output functions allows utilities to continuously monitor these inputs and outputs.

The IEC 61850 standard and Synchrophasor technology offer a unique solution for self-monitoring solutions that may allow utilities to minimize maintenance procedures and extend maintenance intervals under the NERC PRC-005-03.

Description

The project constructs a substation automation system lab simulator using BPA standard SER/SCADA equipment and BPA standard protective relays. It will show that by applying PMU technology that is integrated in microprocessor relays, can be used to compared from redundant sets to validate their AC signals. The technology also utilizes the monitoring features found in the 61850 standard.

Work will include:

- The performance of basic interoperability test's between IED and SER/SCADA RTU;
- Utilization of the protective scheme developed in 2013 that consists of a bus differential/breaker failure relay protection design that replaces the 86 lockout relays by using GOOSE messages over an Ethernet network.
- Make sure project is compatible with the NERC CIP via the FIN security. Define FIN security requirements and apply them to design of project simulator
- Contracting NovaTech to develop HMI screens and logic to monitor AC Inputs using PMUs and input and outputs using GOOSE messaging.
- Construct a substation automation system lab simulator using BPA standard SER/SCADA equipment and BPA standard protective relays
- Troubleshoot configurations for Security and Reliability
- Review Results and determine if knowledge gained can be applied to Capital Project in 2016

Why It Matters

Results from the project will demonstrate how to minimize maintenance procedures and extend maintenance intervals for 12 years or beyond with a self-monitoring substation protection system that meets the relay maintenance standard NERC-PRC-005-3.

Goals and Objectives

This project researches the application of 61850 technologies available in the substation SER/SCADA equipment, and the PMU data available in protective relays for the purpose of developing self-monitoring substation automation that meets the NERC-PRC-005-3 standard

Deliverables

- A complete design package for the substation automation lab simulator that includes; All system protection drawings including, one-line, schematics, wiring diagrams, GOOSE message tables; Network design diagram; Relay setting and configuration files; 61850 configuration files; Data System Design prints including alarms schematics and logic diagrams; RTU Configuration File
- Substation automation simulator
- Report documenting the results of the capabilities of the substation automation system to monitor protective relays and the ways the meet the NERC PRC-005-3 standard

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Project Start Date: October 1, 2014

Project End Date: September 30, 2015

Reports & References (Optional)

Links (Optional)

Funding

Total Project Cost: \$281,000

BPA FY2015 Budget: \$120,000

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Participating Organizations

NovaTech

